Spray and Fuse Coatings

The surface phase of all components is exposed to its immediate environment. This environment can simplistically be corrosive, abrasive (wear damage) or a combination of several different and complex damage mechanisms. Several surfacing techniques are used to protect the surface phase, from microstructural changes, through nitriding or carburising or through additive coatings through thermal spraying and welding.

A thermal spray technique that is not utilised often in practice anymore, but has tremendous potential, is the spray and fuse technique. This technique is a two-step process comprising of a coating applied typically by one of the combustion spray processes such as flame spray, followed by a fusing process in which the coated material is heated above its fusion temperature to produce a highly dense coating with a metallurgical bond to the substrate.

The spray and fuse coating materials are self-fluxing alloys i.e., they contain elements that react with oxygen to form low-density oxides that "float" to the surface, thus improving density and bonding. In general, nickel- or cobalt-base alloys that use boron, phosphorus, or silicon, (either singly or in combination, as melting-point depressants) and fluxing agents are used. The alloys used generally fused between 1010 to 1175 degrees Celsius, depending on its composition. Reducing atmosphere flames are mostly used to ensure a clean, well-bonded coating.

Post coating operations, like grinding, are usually necessary for finishing a spray and fused coating due to the high hardness of the coating. The use of spray and fuse coatings is limited to substrate materials that can "tolerate" the 1010° degrees Celsius fusing temperatures, as this might influence the prior heat treatment condition of the base material.

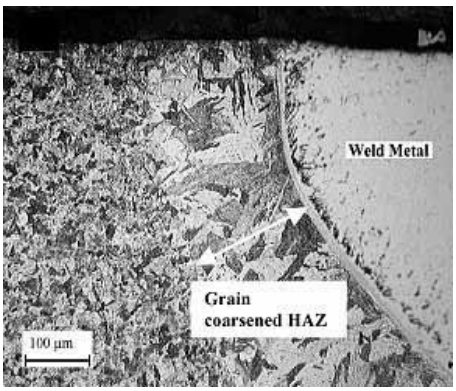

Figure.1. ***Metallurgical Bond***

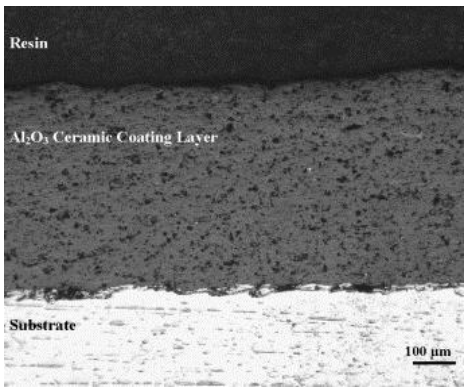

Figure.2. ***Mechanical Bond***

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Spray and fuse coating benefits include:

- Coatings have a metallurgical bond (Figure.1.) with the base material whereas other thermal spray coatings have a mechanical bond (figure.2.).
- These coatings are widely used in applications where excessive wear combined with high stresses on the coating / substrate (shear or impact) are encountered.
- Coatings are able to handle extreme physical abuse and still maintain its bond to the base material.
- The coatings are much more resistant to chipping than other thermal spray coatings.
- Due to the high percentage of Nickel and /or Cobalt in the spray and fuse coatings, the coatings and substrates are protected against atmospheric corrosion.
- Spray and fuse coatings maintain a higher degree of its initial hardness with increase in operating temperature up to 600 degrees Celsius.

In a recent spray and fuse application, Thermaspray coated cooling bed rolls for a major steel producing company in South African. After one year in operation, the spray and fused coating remains in near perfect condition and has outlasted any previously applied coating.

Discuss your Particular Needs with Thermaspray.

Please call us to discuss how best to protect new equipment and recondition existing equipment for improved performance, prolonged lifespan, and reduced maintenance and replacement costs.

We look forward to hearing from you.

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